ASSIGNMENT 2

Textbook assignment: Chapter 2, "Oscillators," pages 2-1 through 2-38.

2-1. A sinusoidal oscillator can be regarded as which of the following types of amplifiers?

1. One that produces a trapezoidal wave
2. One that produces a sine wave
3. One that produces a square wave
4. One that produces a sawtooth wave

2-2. Wave generators are classified according to the

1. input wave shape
2. output wave shape
3. current in the output
4. voltage in the output

2-3. An IDEAL sinusoidal oscillator would produce which of the following outputs?

1. A square wave of constant frequency and amplitude
2. A square wave of varying frequency and amplitude
3. A sine wave of constant frequency and amplitude
4. A sine wave of varying frequency and constant amplitude

2-4. What three circuits are most commonly used as frequency determining devices?

1. Class C amplifier, class B amplifier, and class A amplifier
2. Crystal-controlled oscillator, RC oscillator, and LC oscillator
3. Common-emitter amplifier, common-base amplifier, and common-collector amplifier
4. Transformer coupler, RC coupler, and direct coupler

2-5. Which of the following circuits is NOT a relaxation oscillator?

1. A multivibrator
2. A sawtooth generator
3. A blocking oscillator
4. A sinusoidal oscillator

2-6. Which of the following definitions describes the basic oscillator?

1. A nonrotating device producing alternating current
2. A rotating device producing alternating current
3. A nonrotating device producing direct current
4. A rotating device producing direct current

2-7. Amplitude stability in an oscillator is the ability to

1. produce an increased amplitude in the output
2. produce a variable amplitude in the output
3. maintain a constant frequency in the output
4. maintain a constant amplitude in the output

2-8. Frequency stability in an oscillator refer to its ability to

1. maintain a constant operating frequency
2. maintain a variable operating amplitude
3. maintain a constant amplitude
4. vary operating frequency

2-9. What is the purpose of a buffer amplifier?

1. To provide a direct connection between the oscillator and the load
2. To amplify the output signal of the oscillator
3. To remove frequency distortion from the oscillator
4. To prevent load variations from affecting the oscillator

2-10. Why is class A bias used in oscillators?

1. To develop low power
2. To develop maximum power
3. To maintain low distortion
4. To maintain high efficiency

2-11. When a group of RC networks is used for regenerative feedback, which of the following waveform actions takes place in each successive stage?

1. Waveform is rectified
2. Amplitude is decreased
3. Amplitude is increased
4. Amplitude is held constant

2-12. When RC networks are connected in cascade (series), what amount of phase shift should you see?

1. The sum of the phase shifts of each RC network
2. The difference between the phase shifts of each RC network
3. The product of the phase shifts of each RC network
4. The square of the phase shifts of each RC network

2-13. Which of the following terms describes the gradual amplitude reduction in an oscillator?

1. Damping
2. Phase shift
3. Regeneration
4. Flywheel effect

2-14. Which of the following formulas can be used to figure frequency in an LC tank circuit?

1. $f_r = \frac{1}{2\pi LC}$

2. $f_r = \frac{1}{2\pi\sqrt{LC}}$

3. $f_r = \frac{1}{2\pi\sqrt{X_C}}$

4. $f_r = \frac{1}{2\pi\sqrt{X_C L_C}}$

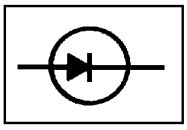
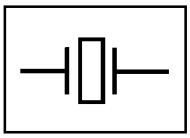
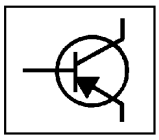
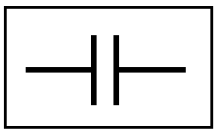
2-15. Which of the following actions best describes the piezoelectric effect?

1. Produces an dc output voltage for a given ac input voltage
2. Produces an output voltage for a given mechanical input
3. Produces a mechanical output for a given input voltage
4. Both 2 and 3 above

2-16. The piezoelectric effect is the property of a crystal which produces which of the following electrical characteristics?

1. Resistance
2. Inductance
3. Capacitance
4. Each of the above

2-17. What is the schematic symbol for a crystal?

1. 
2. 
3. 
4. 

2-18. What electrical characteristic makes the frequency stability of a crystal better than that of an LC tank circuit?

1. Higher Q
2. Higher inductance
3. Higher resistance
4. Higher capacitance

2-19. How is feedback described?

1. Control of a circuit output signal by the input signal
2. Control of a circuit input signal by the output of the previous circuit
3. Transfer of a portion of the output circuit energy to control the input of the circuit
4. Transfer of a portion of the input circuit energy to control the output circuit

2-20. Which of the following terms describes the types of feedback?

1. Degenerative and regenerative
2. Negative and positive
3. Both 1 and 2 above
4. Bypassed and unbypassed

2-21. What type of feedback aids an input signal?

1. Positive
2. Negative
3. Bypassed
4. Degenerative

2-22. What type of feedback opposes an input signal?

1. Positive
2. Unbypassed
3. Degenerative
4. Regenerative

2-23. What type of feedback is used to sustain oscillations?

1. Bypassed
2. Negative
3. Degenerative
4. Regenerative

2-24. What oscillator uses a tickler coil for feedback?

1. Hartley
2. Colpitts
3. Armstrong
4. RC phase-shift

2-25. What oscillator uses a tapped coil for feedback?

1. Hartley
2. Colpitts
3. Armstrong
4. RC phase-shift

2-26. What oscillator uses split capacitors for feedback?

1. Hartley
2. Colpitts
3. Armstrong
4. RC phase-shift

TO ANSWER QUESTIONS 2-27 THROUGH 2-29, SELECT THE CONFIGURATIONS IN COLUMN B THAT MATCH THE AMPLIFIER CHARACTERISTICS IN COLUMN A. CHOICES IN COLUMN B MAY BE USED ONCE, MORE THAN ONCE OR NOT AT ALL.

A. CHARACTERISTICS	B. CONFIGURATIONS
2-27. Voltage gain is less than unity	1. Common-base
	2. Common-gate
	3. Common-emitter
2-28. Low power gain	4. Common-collector
2-29. Feedback signal requires phase shift	

2-30. Which of the following statements best describes tank current in a series-fed oscillator?

1. The dc path is through the tank circuit
2. The dc path does not go through the tank circuit
3. The ac path is through the tank circuit
4. The ac path does not go through the tank circuit

2-31. In a shunt-fed, tuned-collector Armstrong oscillator, what blocks the dc component from the tank circuit?

1. A resistor
2. A capacitor
3. An inductor
4. A transistor

2-32. Which of the following circuit arrangements aid in the frequency stability of an oscillator?

1. A regulated power supply
2. A common bias source for the emitter and collector
3. Both 1 and 2 above
4. Separate bias sources

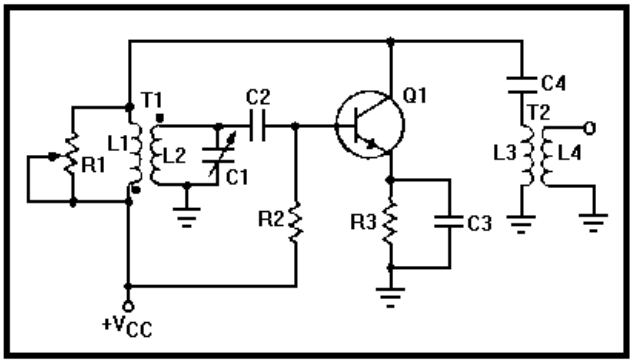


Figure 2A.—Tuned-base Armstrong oscillator.

IN ANSWERING QUESTIONS 2-33 THROUGH 2-37, REFER TO FIGURE 2A.

2-33. The frequency of the output signal of the oscillator is determined by what components?

1. R1 and L1
2. L2 and C1
3. L3 and C4
4. R3 and C3

2-34. Forward bias for the amplifier is developed by what component?

1. R1
2. R2
3. R3
4. L1

2-35. The resonant frequency is tuned to the desired value by what component?

1. C1
2. C2
3. L3
4. L1

2-36. What is the maximum degree of phase shift provided between the base and collector of Q1?

1. 0 degrees
2. 90 degrees
3. 120 degrees
4. 180 degrees

2-37. Temperature stability of the oscillator is improved by what component?

1. R1
2. R2
3. R3
4. C4

2-38. What feature in a Hartley oscillator differs from an Armstrong oscillator?

1. Tickler coil
2. Split inductor
3. Split coupling
4. Split capacitance

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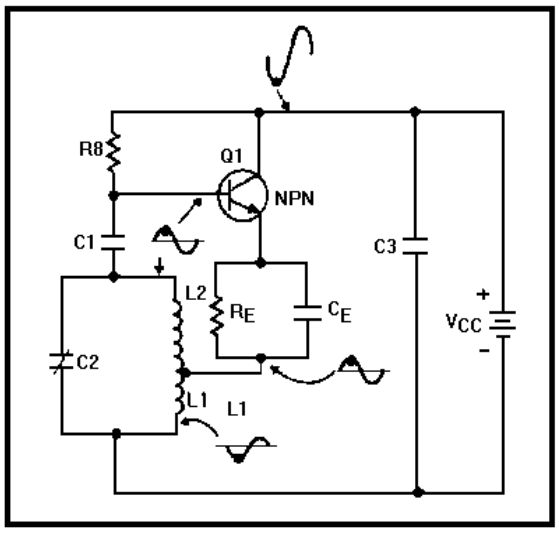

Figure 2B.—Series-fed, tuned-base Hartley oscillator.

IN ANSWERING QUESTIONS 2-39 THROUGH 2-42, REFER TO FIGURE 2B.

2-39. What components are part of the frequency-determining device of this oscillator?

1. C1, L1, and L2
2. C2, L1, and L2
3. C3, L1, and L2
4. C_E, R_E, and R_B

2-40. What circuit component prevents thermal runaway?

1. L1
2. C_E
3. R_B
4. R_E

2-41. The low resistance of L2 could place a short across the emitter-to-base junction network of Q1 and R_E. What component in the circuit prevents this from happening?

1. C1
2. C2
3. C3
4. C_E

2-42. When a positive signal is coupled to the base of Q1, what happens to (a) collector current and (b) emitter current?

1. (a) Increases (b) increases
2. (a) Increases (b) decreases
3. (a) Decreases (b) decreases
4. (a) Decreases (b) increases

2-43. A tuned-base Hartley oscillator is described as "shunt fed" when

1. ac flows through the tank circuit
2. dc flows through the tank circuit
3. ac does not flow through the tank circuit
4. dc does not flow through the tank circuit

2-44. Which of the following advantages does the Colpitts oscillator have over the Armstrong and Hartley oscillators?

1. Easier to tune
2. Wider frequency range
3. Better frequency stability
4. All of the above

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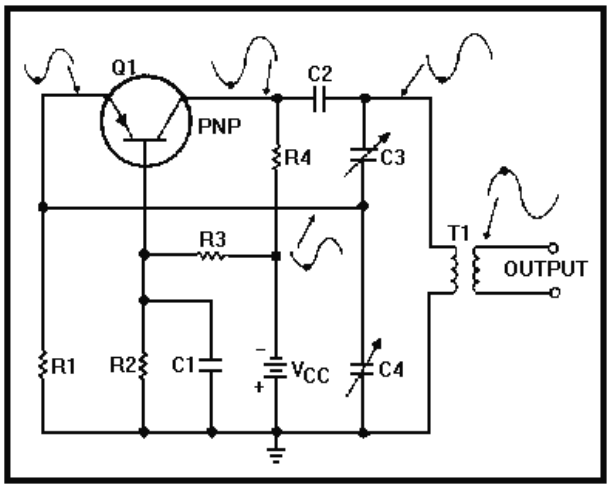

Figure 2C.—Oscillator.

IN ANSWERING QUESTIONS 2-45 THROUGH 2-47, REFER TO FIGURE 2C.

2-45. What type of oscillator is shown in the figure?

1. Common-base Hartley
2. Common-base Colpitts
3. Common-emitter Colpitts
4. Common-collector Hartley

2-46. What component is the collector load resistor?

1. R1
2. R2
3. R3
4. R4

2-47. What resistors provide the base bias?

1. R1, R2
2. R2, R3
3. R3, R4
4. R2, R4

2-48. What class of biasing does the RC oscillator use?

1. A
2. B
3. C
4. AB

2-49. In an RC network, (a) what type of impedance is presented and (b) does the current lead or lag?

1. (a) Inductive (b) leads
2. (a) Inductive (b) lags
3. (a) Capacitive (b) lags
4. (a) Capacitive (b) leads

2-50. In the phase-shift oscillator, a phase shift of 180 degrees for regenerative feedback is provided by what minimum number of RC networks?

1. One
2. Two
3. Three
4. Four

2-51. What determines the phase angle of an RC network?

1. Input voltage
2. Output voltage
3. Values of resistance and inductance
4. Values of resistance and capacitance

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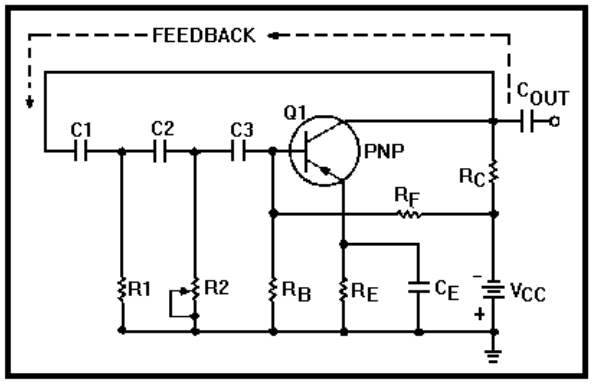

Figure 2D.—Phase-shift oscillator.

IN ANSWERING QUESTIONS 2-52 THROUGH 2-56, REFER TO FIGURE 2D.

2-52. What is the maximum amount of phase shift provided by Q1 in the figure?

1. 0 degrees
2. 60 degrees
3. 90 degrees
4. 180 degrees

2-53. What type of feedback is provided through the RC networks to the base of Q1?

1. Neutral
2. Negative
3. Regenerative
4. Degenerative

2-54. At any other than the desired frequency, what type of feedback is provided by the circuit?

1. Neutral
2. Positive
3. Regenerative
4. Degenerative

2-55. What components make up the frequency-determining device?

1. C1, C2, C_E, R1, R2, R_B
2. C2, C3, C_E, R2, R_B, R_E
3. C1, C2, C3, R1, R2, R_B
4. C_{out}, C1, C2, R1, R2, R_E

2-56. What is the maximum amount of phase shift provided by the C3-R_B network?

1. 90 degrees
2. 80 degrees
3. 70 degrees
4. 60 degrees

2-57. Which of the following is the correct formula for the resonant frequency of a phase-shift oscillator?

1. $f_r = \frac{1}{2\pi\sqrt{LC}}$
2. $f_r = \frac{1}{2\pi RC\sqrt{2n}}$
3. $f_r = \frac{1}{2\pi\sqrt{fL}}$
4. $f_r = \frac{1}{2\pi\sqrt{RC}}$

2-58. Which of the following oscillators is used to provide a highly stable output at a very precise frequency?

1. Crystal
2. Hartley
3. Colpitts
4. Armstrong

2-59. The frequency of a crystal-controlled oscillator is determined by which of the following physical actions?

1. Type of cut
2. Accuracy of cut
3. Thickness of grinding
4. All of the above

2-60. Why is the crystal in a crystal-controlled oscillator often installed in a temperature-controlled oven?

1. To increase frequency without changing the crystal
2. To decrease frequency without changing the crystal
3. To provide better amplitude stability
4. To provide better frequency stability

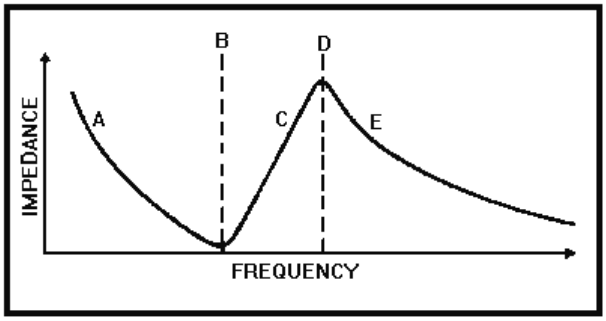

Figure 2E.—Frequency response of a crystal.

IN ANSWERING QUESTIONS 2-61 THROUGH 2-64, REFER TO FIGURE 2E. THE LETTERS A, B, C, D, AND E ARE POINTS ON THE FREQUENCY-RESPONSE CURVE FROM WHICH YOU SHOULD SELECT ANSWERS TO THE QUESTIONS.

2-61. At what point on the curve does a crystal act as a series-tuned circuit?

1. A
2. B
3. C
4. D

2-62. At what point does the crystal act inductively?

1. A
2. B
3. C
4. D

2-63. Below series resonance, a crystal acts capacitively at what point on the curve?

1. A
2. B
3. C
4. E

2-64. At what point does the crystal act purely as a parallel-resonant circuit?

1. B
2. C
3. D
4. E

2-65. How is the Q of a crystal determined?

1. Type of cut used
2. Type of holder used
3. Accuracy of the grinding
4. All of the above

2-66. An oscillator that is turned ON for a specific period of time, then is turned OFF and remains OFF until required at a later time, is which of following types?

1. LC
2. Pierce
3. Pulsed
4. Crystal

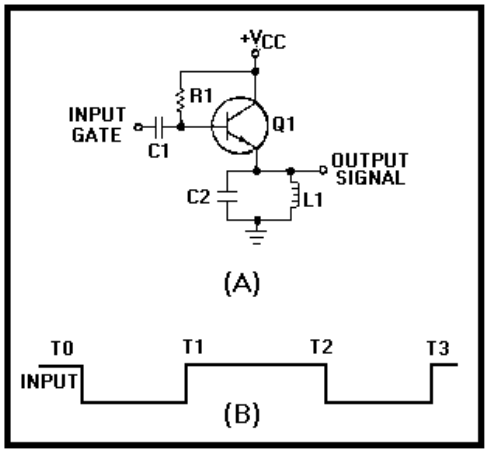

Figure 2F.—Oscillator circuit.

IN ANSWERING QUESTIONS 2-67 THROUGH 2-70, REFER TO FIGURE 2F.

2-67. What circuit is shown in the figure?

1. Pierce oscillator
2. Pulsed oscillator
3. Colpitts oscillator
4. Armstrong oscillator

2-68. Sine waves are generated in the emitter circuit of Q1 during which of the following time periods of the input gate?

1. T0 to T1 and T1 to T2
2. T0 to T1 and T2 to T3
3. T1 to T2 and T3 to T4
4. T1 to T3 and T0 to T4

2-69. The frequencies in the output are determined by what two circuit parameters?

1. Input gate time and the time the circuit is turned OFF
2. Output gate time and the time the circuit is turned ON
3. Input gate time and the resonant frequency of the tank circuit
4. Output gate time and the resonant frequency of the tank circuit,

2-70. If the resonant frequency of the tank circuit were 5 megahertz and transistor Q1 were cut off for 500 microseconds, what maximum number of cycles of the tank frequency would be present in each pulse of the output?

1. 500 cycles
2. 1,500 cycles
3. 2,500 cycles
4. 3,500 cycles

2-71. What is the fourth harmonic of a 2-megahertz signal?

1. 6 megahertz
2. 2 megahertz
3. 8 megahertz
4. 4 megahertz

2-72. What is the highest multiplication factor normally used in frequency multipliers?

1. One
2. Two
3. Three
4. Four

2-73. As the multiplication factor in a frequency multiplier circuit is increased, what happens to the output signal (a) amplitude and (b) frequency?

1. (a) Increases (b) increases
2. (a) Increases (b) decreases
3. (a) Decreases (b) decreases
4. (a) Decreases (b) increases

2-74. In a buffer amplifier, what is the impedance in the (a) input and (b) output?

1. (a) Low (b) low
2. (a) Low (b) high
3. (a) High (b) high
4. (a) High (b) low